More Cost Effective Approaches in Developing Test Program Sets (TPSs) for Various U.S. Air Force Avionics Systems

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Overview

MASoftware Engineering
A Division of the Maintenance Directorate
A CMM Level 3 Organization

- **Introduction**
  - Software Engineering Division
  - Avionics Test Programs Set Branch
- **Background – Yesterday's ATE**
  - Early Automatic Test Equipment
  - Later ATE
- **New Solutions – Examples of Today's ATE**
  - High-speed Digital Tester
  - Analog/Digital/RF/EO Tester
- **MASA Low-Cost Tester Initiative**
- **Summary**

Introduction

- **Software Engineering Division -- WR-ALC/MAS**
  - Software Capabilities
- **Avionics Test Programs Set Branch -- WR-ALC/MASA**
  - Services Provided
  - Major Systems Supported
  - TPS Support Organization
  - Workforce Skills Mix

Software Engineering Division

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- **Mission: Provide Innovative, Affordable Software Solutions Vital to the Mission Success of Our Customer**
  - All DMAG Software Activities Consolidated in MAS
  - Software Engineering Process Domains
    - Automatic Test Equipment TPS Development
    - Automatic Test Equipment TPS Maintenance & Modification
    - Operational Flight Programs (OFPs)
  - Software Engineering Institute (SEI) Capability Maturity Model (CMM)
    - Avionics Test Programs Set Branch - Level 3 (September 1995)
    - Entire Software Engineering Division - Level 3 (April 2000)
  - International Projects (ISO 9001 Compliant - Certified 2001)

Software Capabilities

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- **Complete Software Development Capabilities**
  - Requirements Analysis through Fielding of Software
  - Software Development, Modifications and Maintenance
    - Partnering or Non-Partnering
- **Extensive System and Software Test Capabilities**
  - Component Level Testing through Operational Test and Evaluation Support
  - State-of-the-Art Software Engineering Environments
    - High-Fidelity Models and Simulations
    - In-Circuit Emulators
    - Data Recording/Reduction/Analysis
- **Comprehensive Software Project Management Capabilities**
  - Project Mgmt, Requirements Mgmt, Risk Mgmt, SCM, QA, Documentation
  - COTS Management Tools
  - Customized Project Management Accounting Tools

Avionics Test Programs Set Branch

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- **Services Provided**
  - Test Program Set (TPS) Development -- Analog, Digital, RF
  - TPS Sustainment -- Maintenance, Modification, Rehost
  - Software Engineering Services -- ATS Support, QA, IV&V
- **Major Systems Supported**
  - F-15 (APG-63, APG- 70, AVQ-20)
  - LANTIRN ATE/ETF/FMS
  - JSTARS (APY-3, ARY-3)
  - B-52 OAS
  - APN-169
  - MC-130H (APQ-170, CP2108A)
  - AC-130H (APQ-170, CP2108A, AIC-30/38/40)
  - SOF (AAQ-15/17/18)
  - E-3 AWACS (various systems)
  - Global Positioning System (GPS)

Avionics Test Programs Set Branch (cont'd)

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- **TPS Support Organization**
  - In the TPS Business ~ 1968
  - Workforce – 83
  - Over 1000 TPSs Developed
  - Over 2500 TPSs Supported
  - Over 180 Test Stations Involved
- **Workforce Skills Mix**
  - Electronics Engineers
  - Electronics Technicians
  - Technical Data Clerks
  - Electronics Engineering Managers
  - Other

Background – Yesterday's ATE

- **Early Automatic Test Equipment (ATE)**
  - General Purpose Automatic Tester (GPATS)

Background – Yesterday's ATE (cont'd)

- **Later ATE**
  - IFTE - GPS
  - COMETS - F-111
  - ADTS - F-15
  - GenRad - A-10
  - DATSA - B-1B
  - GSM-285 - E-3

Integrated Family of Test Equipment (IFTE)

New Solutions – Examples of Today's ATE

- **High-Speed Digital Tester**
  - Teradyne
    - Spectrum 9100 Series

New Solutions – Examples of Today's ATE (cont'd)

- **Analog/Digital/RF/EO**
  - ATTI
    - Benchtop Reconfigurable Automatic Tester (BRAT)

MASA Low-Cost Tester Initiative

- **Low-Cost Digital/Analog Circuit Tester**
  - DiagnoSYS
    - PinPoint II

MASA Low-Cost Tester Initiative (cont'd)

Tools in the Virtual Instrument Mode for real-time testing.

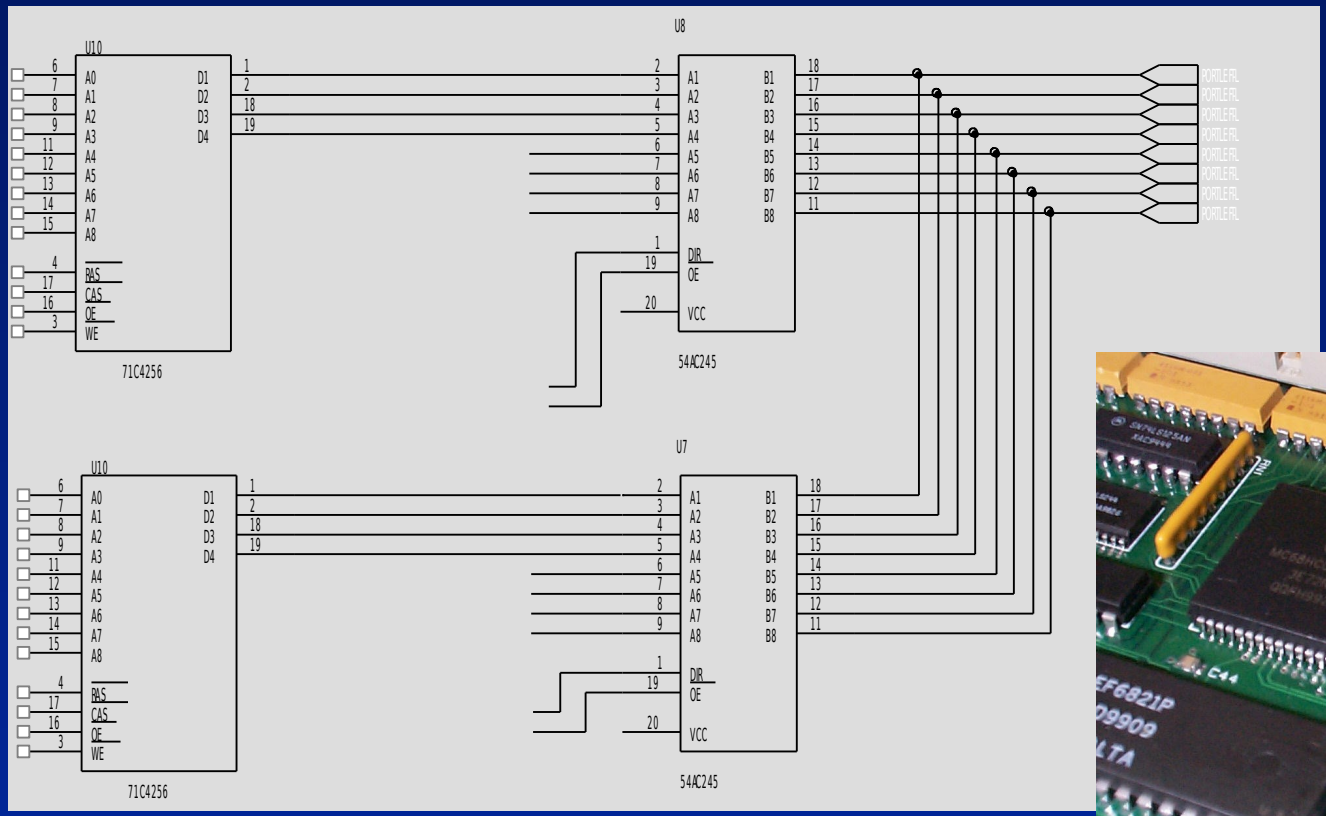
Counter / Timer

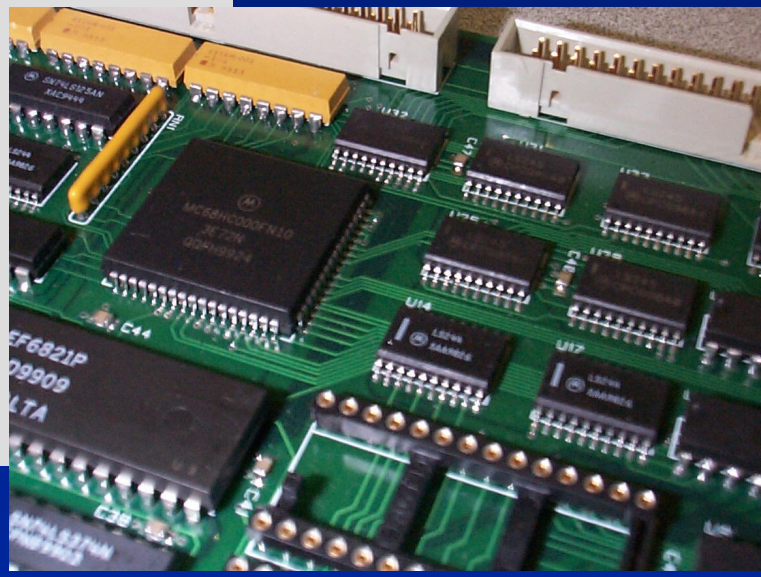
Arbitrary Waveform Generator

DMM

MASA Low-Cost Tester Initiative (cont'd)

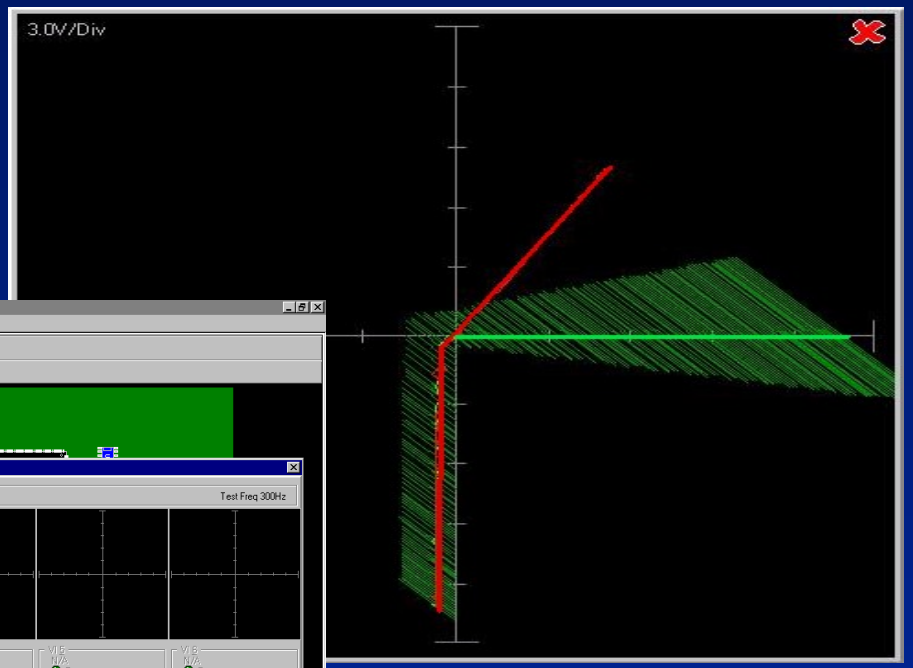
Generate Schematics and Documentation for uncharted circuit cards.

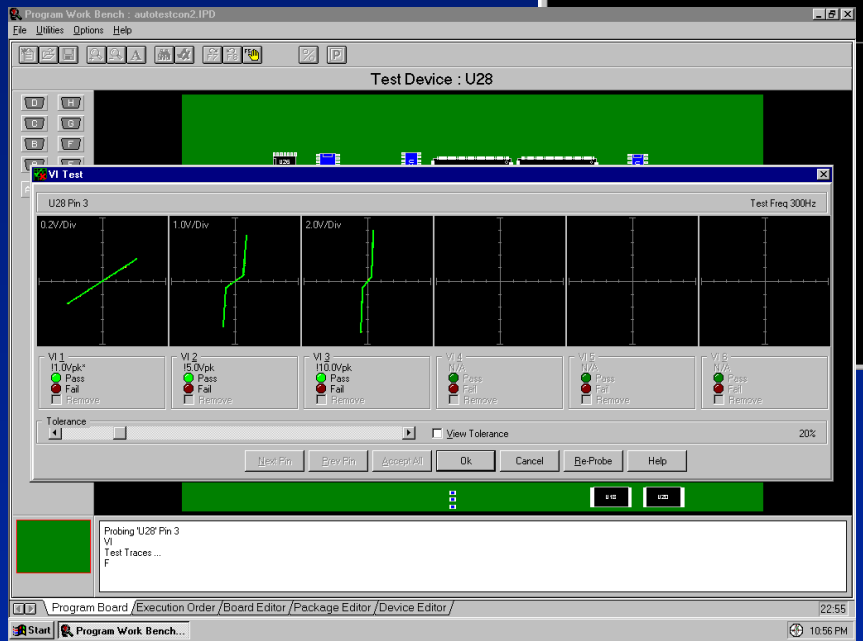




MASA Low-Cost Tester Initiative (cont'd)

InterV3 signature analysis option – passive tests for discrete components and power-off testing.





MASA Low-Cost Tester Initiative (cont'd)

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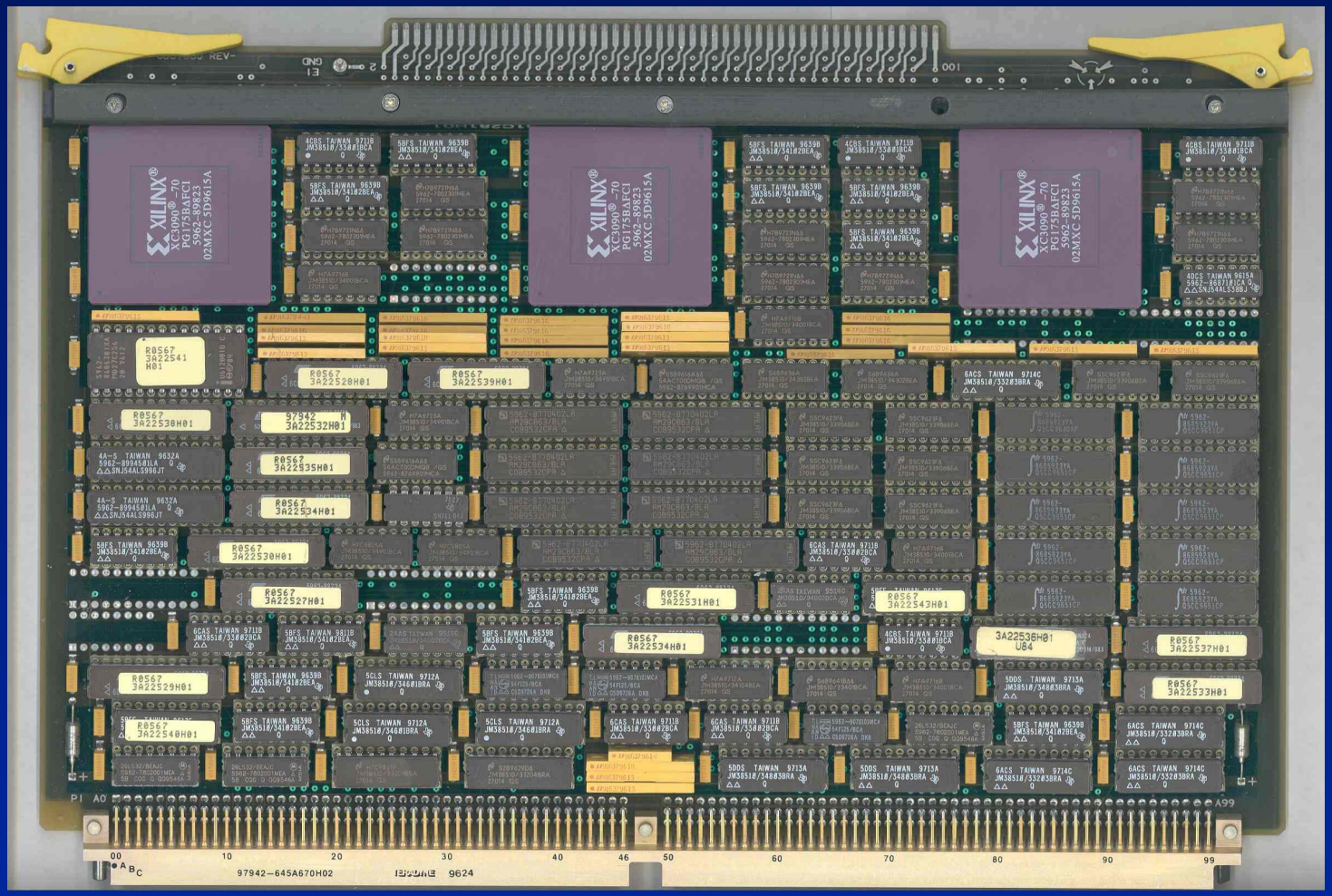
Data Comm Circuit Card Assembly (CCA)



MASA Low-Cost Tester Initiative (cont'd)

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Data Comm CCA Component List

8 – Quad Diff Line Drivers
3 – Quad Diff Line Receivers
8 – Bus Transceivers
16 – PALs
1 – 32k x 8 EPROM
10 – 16k x 4 SRAMs
1 – 4 Wide AND-OR-INVERT
6 – Quad, 2-I/P NANDs
4 – Quad, 2-I/P ANDs
5 – Hex Inverters
13 – Dual, J-K FFs
2 – Triple 3-I/P ANDs
3 – Quad, Buffers
2 – 4-Bit Binary Counters
1 – Quad, D-FF
5 – Octal Buffers
3 – Octal receivers
8 – Quad Data Selectors
4 – Parity generators
3 – Octal Latches
1 – Quad, 2I/P NAND
1 – Octal Buffer
2 – 8-Bit D Latches
3 – Gate Arrays (XILINX XC3090)

Summary

- MASA is developing a test program for the Data Comm circuit card assembly using the DiagnoSYS PinPoint II PC-based test station.
- This new tester initiative will determine how additional ATE TPSs may be supplemented and how to lower total avionics' supportability costs.
- The low-cost tester will aid/enhance the production shop's ability to test and repair high-density component circuit cards, thus keeping production costs to a minimum.
- As the newer PC-based ATE systems are incorporated in the avionics testing world, lower costs will inevitably be obtained by the customer.